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STARK WIDTHS OF Mg III LINES

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Abstract. We present here Stark widths for 3s-3p transitons of doubly charged magnesium ion. Calculations were performed by using the modified semiempirical approach.

1. INTRODUCTION

Stark broadening data are important for investigation, diagnostics and modelling of astrophysical and laboratory plasma, as well as of plasmas in technology and of laser produced plasmas (see e.g. Dimitrijević 1989, 1990). The research of lines of magnesium in various ionization stages is of particular interest due to its high cosmical abundance. Moreover, due to its ionization potential value, Mg I, Mg II and Mg III lines are present in solar and stellar spectra and the corresponding Stark broadening data are of interest for their analysis as well (e.g. lines of Mg III are present in UV spectra of early B stars, Swings et al. 1976).

Recently, Stark broadening for 267 Mg I lines for stellar conditions (Dimitrijević and Sahal-Bréchot 1996a), 99 Mg I lines for laboratory plasma conditions (Dimitrijević and Sahal-Bréchot 1995) and 67 Mg II lines (Dimitrijević and Sahal-Bréchot 1996b), have been considered within the semiclassical - perturbation formalism (Sahal-Bréchot 1969ab). Due to the lack of reliable atomic data, it is not possible to apply the semi-classical - perturbation formalism to Mg III lines in an adequate way. Consequently, in order to complete the needed Stark broadening data for astrophysically important spectral lines of magnesium, the modified semiempirical approach (Dimitrijević and Konjević 1980) will be applied here for the Mg III spectrum. The results for Stark widths for 3s - 3p transitions within six multiplet of Mg III, will be presented here.

2. RESULTS AND DISCUSSION

Calculations of Stark widths were performed within the modified semiempirical approach (Dimitrijević and Konjević 1980, see also Popović and Dimitrijević 1996). The needed atomic data were taken from Martin and Zalubas (1980). For the matrix elements calculation, the Bates and Damgaard (1949) approximation has been used, as well as the LS coupling, since for 3s – 3p trasitions, this coupling is more appropriated than $j\ell$ (see Martin and Zalubas 1980).

Table 1. Stark full widths (FWHM) for Mg III spectral lines. The electron density is 10^{23}m^{-3}. The avaraged wavelength of the multiplet is denoted by $\overline{\lambda}$.

Transition	T (K)	W (nm)
$3s^1P_1^0 - 3p^1D_2$ $\lambda = 217.8$ nm	5000.	.567E-02
	10000.	.397E-02
	20000.	.277E-02
	30000.	.224E-02
	40000.	.193E-02
	50000.	.172E-02
$3s^1P_1^0 - 3p^1P_1$ $\lambda = 213.4$ nm	5000.	.551E-02
	10000.	.387E-02
	20000.	.270E-02
	30000.	.218E-02
	40000.	.188E-02
	50000.	.168E-02
$3s^1P_1^0 - 3p^1S_0$ $\lambda = 155.0$ nm	5000.	.343E-02
	10000.	.240E-02
	20000.	.168E-02
	30000.	.136E-02
	40000.	.117E-02
	50000.	.104E-02
$3s^3P^0 - 3p^3S$ $\overline{\lambda} = 243.4$ nm	5000.	.631E-02
	10000.	.443E-02
	20000.	.309E-02
	30000.	.250E-02
	40000.	.215E-02
	50000.	.192E-02
$3s^3P^0 - 3p^3D$ $\overline{\lambda} = 207.2$ nm	5000.	.484E-02
	10000.	.339E-02
	20000.	.237E-02
	30000.	.191E-02
	40000.	.165E-02
	50000.	.147E-02
$3s^3P^0 - 3p^3P$ $\overline{\lambda} = 189.3$ nm	5000.	.392E-02
	10000.	.275E-02
	20000.	.192E-02
	30000.	.155E-02
	40000.	.134E-02
	50000.	.119E-02

Our results for Stark widths are presented in Table 1, as a function of temperature, for an electron density of $10^{23}m^{-3}$. We hope that the obtained data will be of help for the analysis and modelling of stellar plasma.

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